

AMENDMENTS TO THE CLAIMS

The following **Listing of Claims** replaces all prior versions and listings of claims in this application. Please amend claims 4, 6, 11, 12, 15, 19 and 20. Please cancel claim 8.

LISTING OF CLAIMS

Claim 1 (Canceled)

Claim 2 (Withdrawn): A cleaning method of a film-forming unit that forms a thin film on an object to be processed by supplying a process gas into a reaction chamber containing the object to be processed, the method comprising;

a purging step of purging an inside of the reaction chamber by supplying into the reaction chamber a nitrogen-including gas that includes nitrogen and that is capable of being activated,

wherein the purging step has a step of activating the nitrogen-including gas and causing the activated nitrogen-including gas to react with metallic contaminant contained in a member in the reaction chamber so as to remove the metallic contaminant from the member.

Claim 3 (Withdrawn): A cleaning method of a film-forming unit that forms a thin film on an object to be processed by supplying a process gas into a reaction chamber containing the object to be processed, the method comprising;

a deposit-removing step of removing a deposit stuck to an inside of the film-forming unit by supplying into the reaction chamber a cleaning gas that includes fluorine, and

a purging step of purging an inside of the reaction chamber by supplying into the reaction chamber a nitrogen-including gas that includes nitrogen and that is capable of being activated,

wherein the purging step has a step of activating the nitrogen-including gas and causing the activated nitrogen-including gas to react with the fluorine diffused into a member in the reaction chamber during the deposit-removing step, so as to remove the fluorine from the member.

Claim 4 (Currently amended) A cleaning method of a film-forming unit that forms a thin film on an object to be processed by supplying a process gas into a reaction chamber containing the object to be processed, the method comprising:

a deposit-removing step of removing a nitride deposit stuck to an inside of the film-forming unit by supplying into the reaction chamber a cleaning gas that includes fluorine, and
a purging step of purging an inside of the reaction chamber by supplying into the reaction chamber a nitrogen-including gas that includes nitrogen and that is capable of being activated, wherein the purging step has a step of nitriding a surface of a member in the reaction chamber by activating the nitrogen-including gas, the nitride deposit-removing step and the purging step being in predetermined time sequence in the following order according to a recipe, the recipe comprising, for the nitride deposit-removal step, loading at ~~normal~~ a first predetermined pressure to seal the film-forming unit, stabilizing at a first predetermined temperature range of approximately 300° C, cleaning at a ~~maximum predetermined~~ first vacuum pressure range at a pressure between 100.0 Torr and 400.0 Torr by introducing the cleaning gas that includes fluoroine and, for the purging step, stabilizing, ammonia purging at a second, higher predetermined temperature range by increasing the temperature to a temperature within a range between 600° and 1050° C and at a third second predetermined vacuum pressure range between normal and maximum predetermined pressure ranges of less than 100 Torr, stabilizing and unloading at said first predetermined temperature range and ~~normal~~ said first predetermined pressure.

Claim 5 (Previously presented): A cleaning method of a film-forming unit according to claim 4, wherein

the nitrogen-including gas is ammonia, dinitrogen monoxide or nitric oxide.

Claim 6 (Currently amended): A cleaning method of a film-forming unit according to claim 4, wherein

during the ~~purging~~nitride deposit-removing step, the inside of the reaction chamber is maintained at a ~~range of 133 Pa to 53.3 kPa~~vacuum pressure of approximately 150 Torr and a temperature of approximately 300° C by a controller, connected to a heating unit and to different gas supply units, the controller for measuring temperature and pressure at a plurality of positions of said film-forming unit.

Claim 7 (Previously presented): A cleaning method of a film-forming unit according to claim 4, wherein

during the purging step, the nitrogen-including gas is supplied into the reaction chamber heated to a predetermined temperature of approximately 900° C in order to be activated responsive to a controller for measuring temperature and pressure at a plurality of positions of said film-forming unit.

Claim 8 (Cancelled).

Claim 9 (Previously presented): A cleaning method of a film-forming unit according to claim 4, wherein

the member in the reaction chamber consists of quartz.

Claim 10 (Previously presented): A cleaning method of a film-forming unit according to claim 4, wherein

the process gas comprises ammonia and a silicon-including gas,
the thin film is a silicon nitride film, and
the nitrogen-including gas is an ammonia gas.

Claim 11 (Currently amended): A film-forming method for use in a film-forming unit comprising

~~a cleaning step of cleaning a film-forming unit in accordance with a cleaning method of a film-forming unit according to claim 4, and~~

a film-forming step of heating the inside of the reaction chamber containing the object to be processed to a predetermined temperature between 600° C and 1050° C and a predetermined vacuum pressure of less than 1 Torr, and forming a thin film on the object to be processed by supplying a process gas into the reaction chamber, and

a deposit-removing step of removing a nitride deposit stuck to an inside of the film-forming unit by supplying into a reaction chamber a cleaning gas that includes fluorine, and
a purging step of purging an inside of the reaction chamber by supplying into the reaction chamber a nitrogen-including gas that includes nitrogen and that is capable of being activated,

wherein the purging step has a step of nitriding a surface of a member in the reaction chamber by activating the nitrogen-including gas, the nitride deposit-removing step and the purging step being in predetermined time sequence in the following order according to a recipe controlled by a controller connected to a heating unit and to a nitrogen-including gas supply unit, the controller for measuring temperature and pressure at a plurality of positions of said film-forming unit, the recipe comprising, for nitride deposit-removal, loading at a first predetermined pressure to seal the film-forming unit, stabilizing at a first predetermined temperature range of approximately 300° C, cleaning at a first vacuum pressure range at a pressure between 100.0 Torr and 400.0 Torr by introducing the cleaning gas that includes fluorine and, for the purging step, stabilizing, ammonia purging at a second, higher predetermined temperature range by increasing the temperature to a temperature within a range between 600° and 1050° C and at a second predetermined vacuum pressure range of less than 100 Torr, stabilizing and unloading at said first predetermined temperature range and said first predetermined pressure.

Claim 12 (Currently amended) A film-forming unit that forms a thin film on an object to be processed by supplying a process gas into a reaction chamber containing the object to be processed, the film-forming unit comprising:

a nitrogen-including-gas supplying unit that supplies directly into the reaction chamber a nitrogen-including gas that includes nitrogen and that is capable of being activated,

an activating unit that activates the nitrogen-including-gas, the activating unit being a heating unit, [and]

a nitriding unit that nitrides a surface of a member in the reaction chamber by controlling the activating unit so as to activate the nitrogen-including gas, and

a controller, connected to said heating unit and to said nitrogen-including-gas supply unit, for measuring temperature and pressure at a plurality of positions of said film-forming unit and for controlling, according to a recipe, the temperature within the chamber via said heating unit, for controlling a flow of nitrogen-including gas via said nitrogen-including gas supplying unit, and for controlling the nitriding unit in predetermined time sequence in the following order according to said recipe, of loading to seal the film-forming unit and to provide at a first predetermined temperature range of approximately 300° C and normal first predetermined pressure, and stabilizing, then by increasing a temperature to a temperature within a range between 600° and 1050° C for film-forming and reducing the pressure to a first vacuum pressure range of less than 1 Torr, followed by reducing the temperature again to the first predetermined temperature range, where film-forming occurs at a second higher predetermined the temperature range of between 600° and 1050° C and at a first predetermined vacuum pressure range different from of less than 1 Torr normal pressure, the film-forming comprising wafer loading at the first predetermined temperature range and first predetermined pressure, film-forming at a temperature within a range between 600° and 1050° C range, purging and unloading at said first predetermined temperature range and normal said first predetermined pressure.

Claim 13 (Withdrawn): A film-forming unit that forms a thin film on an object to be processed by supplying a process gas into a reaction chamber containing the object to be processed, the film-forming unit comprising;

a nitrogen-including-gas supplying unit that supplies into the reaction chamber a nitrogen-including gas that includes nitrogen and that is capable of being activated,

an activating unit that activates the nitrogen-including gas, and

a contaminant-removal controlling unit that removes metallic contaminant from a member in the reaction chamber by controlling the activating unit so as to activate the nitrogen-

including gas and by causing the activated nitrogen-including gas to react with the metallic contaminant contained in the member.

Claim 14 (Withdrawn): A film-forming unit that forms a thin film on an object to be processed by supplying a process gas into a reaction chamber containing the object to be processed, the film-forming unit comprising;

- a cleaning-gas supplying unit that supplies into the reaction chamber a cleaning gas that includes fluorine,

- a nitrogen-including-gas supplying unit that supplies into the reaction chamber a nitrogen-including gas that includes nitrogen and that is capable of being activated,

- an activating unit that activates the nitrogen-including gas, and

- a fluorine-removal controlling unit that removes fluorine from a member in the reaction chamber by controlling the activating unit so as to activate the nitrogen-including gas and by causing the activated nitrogen-including gas to react with the fluorine diffused into the member.

Claim 15 (Currently amended) A film-forming unit that forms a thin film on an object to be processed by supplying a process gas into a reaction chamber containing the object to be processed, the film-forming unit comprising:

- a cleaning-gas supplying unit that supplies directly into the reaction chamber a cleaning gas that includes fluorine and that is capable of being activated,

- a nitrogen-including-gas supplying unit that supplies directly into the reaction chamber a nitrogen-including gas that includes nitrogen and that is capable of being activated,

- an activating unit that activates the nitrogen-including-gas, the activating unit being a heating unit,

- a nitriding unit that nitrides a surface of a member in the reaction chamber by controlling the activating unit so as to activate the nitrogen-including gas and the cleaning gas according to a recipe, and

- a controller, connected to said heating unit, said nitrogen-including-gas supply unit and said nitriding unit, for measuring temperature and pressure at a plurality of positions of said film-

forming unit and for controlling the temperature within the chamber via said heating unit, for controlling a flow of nitrogen-including gas via said nitrogen-including gas supplying unit, for controlling the flow of cleaning gas via said cleaning-gas supplying unit, and for controlling the nitriding unit in predetermined time sequence in the following order according to said recipe, of loading at a first predetermined temperature range and ~~normal~~ a first predetermined pressure to seal the film-forming unit, stabilizing, film-forming at a higher predetermined temperature by increasing the temperature to a temperature within a range between 600° and 1050° C and a second predetermined vacuum pressure range less than 1 Torr, purging and unloading at said normal first predetermined pressure and cleaning at a ~~maximum~~ predetermined vacuum pressure range of greater than 100 Torr at the first predetermined temperature range..

Claim 16 (Previously presented): A film-forming unit according to claim 12 or 15, wherein

the nitrogen-including gas is ammonia, dinitrogen monoxide or nitric oxide.

Claims 17 and 18 (Canceled)

Claim 19 (Currently amended): A film-forming unit according to claim 12 or 15, wherein

the heating unit heats the inside of the reaction chamber to a range of 600 °C to 1050 °C responsive to the controller.

Claim 20 (Currently amended): A film-forming unit according to claim 12 or 15, further comprising

~~a pressure adjusting unit that maintains~~ said controller maintaining vacuum pressure the inside of the reaction chamber ~~at~~ within the range of 133 Pa to 53.3 kPa, 2 Torr to 400 Torr.

Claim 21 (Previously presented): A cleaning method of a film-forming unit according to claim 4, wherein the cleaning gas comprises fluorine gas.

Claim 22 (Previously presented): A cleaning method of a film-forming unit according to claim 4, wherein the thin film is a silicon nitride film.